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Title: Off-Site Source Recovery Project

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Los Alamos
NATIONAL LABORATORY
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Off-Site Source Recovery Project

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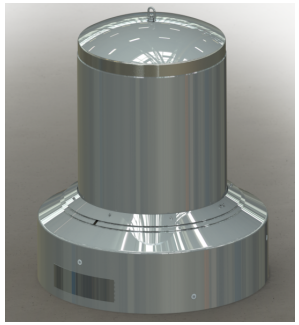
Off-Site Source Recovery Project (OSRP) and National Security

- DOE/NNSA's authority to acquire and provide for the disposition of radioactive materials can be found under sections 55, 66, 81 and 161 of the Atomic Energy Act of 1954, as amended (AEA).
- Every year, thousands of sources become disused and unwanted in the United States which makes them vulnerable to loss and theft. However, in a post 9/11 world it is important that control of radioactive material is maintained throughout the lifecycle of the source/device.
- The Office of Radiological Security's (ORS) OSRP program has the NNSA sponsored mission to remove excess, unwanted, abandoned, or orphan radioactive sealed sources that pose a potential risk to national security, public health and safety.

What is the OSRP?

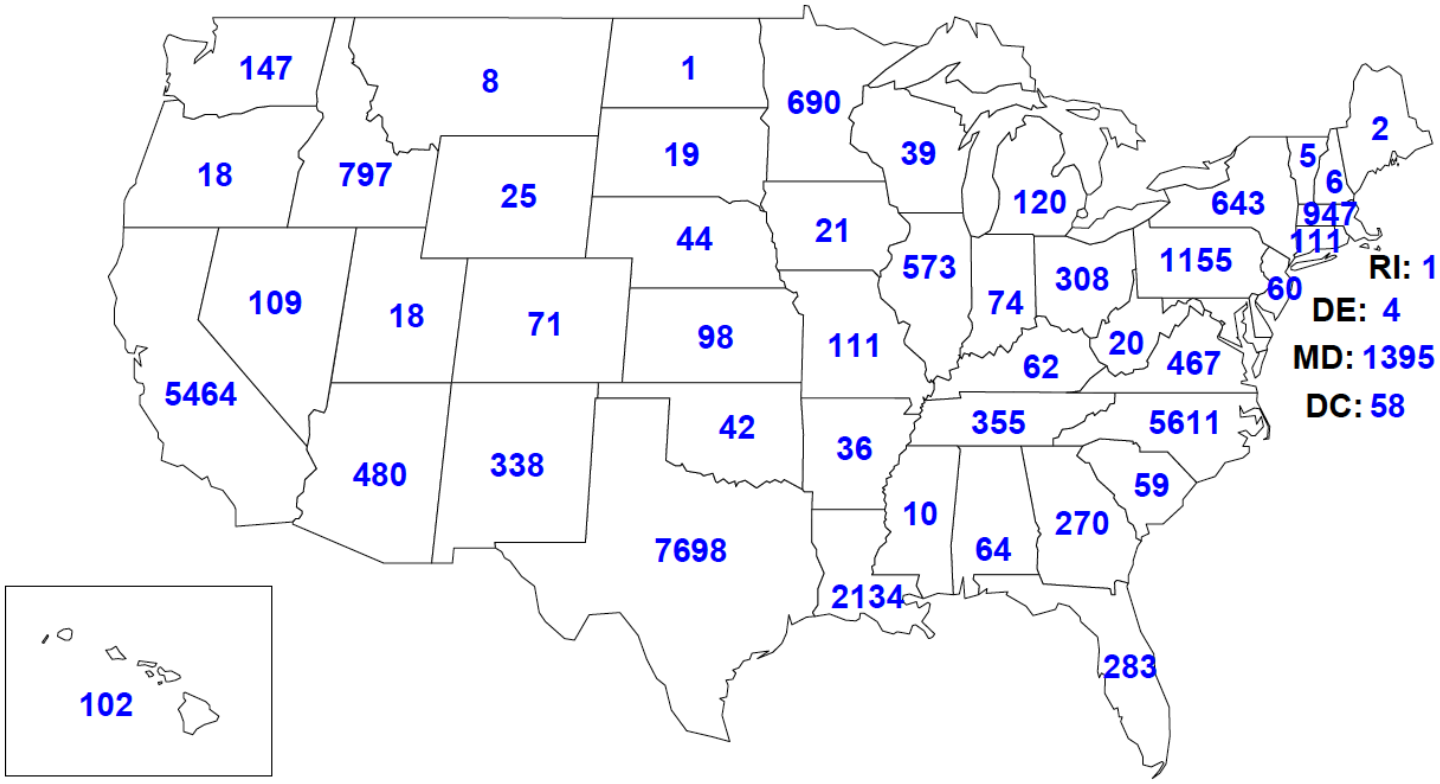
- Begun in 1999 at Los Alamos National Laboratory as part of DOE-EM
- Recovers and permanently dispositions excess, unwanted sealed sources
- Manages ten primary isotopes, including: Am-241, Cf-252, Cm-244, Co-60, Cs-137, Ir-192, Ra-226, Pu-238, Pu-239, and Sr-90
- Other source types managed as needed.
- Now within NNSA Global Material Security as part of Office of Radiological Security

Accomplishments



- In calendar year 2014, OSRP recovered 2,266 radioactive sources (over 104,000 Curies) from 65 different locations.
- In 2014 OSRP marked a major project milestone in recovery efforts by recovering its one millionth curie (Ci) of disused and unwanted radioactive sources.
- As experts in the field of source recovery and radiation safety, participated in workshops and provided training to participants from Peru, Morocco, Latvia/Estonia, Senegal/Mauritania, Mongolia, Iraq, Kenya/Malawi, Myanmar, El Salvador, and Slovakia.
- Oversaw the design of two new Type B shipping container. The U.S. Nuclear Regulatory Commission issued a Certificate of Compliance [USA/9355/B(U)-96] for the first container and the Safety Analysis report should be submitted to the NRC later this year.

OSRP Recoveries In the US



Total U.S. Sources: 31,176 (1,012,279 Ci)

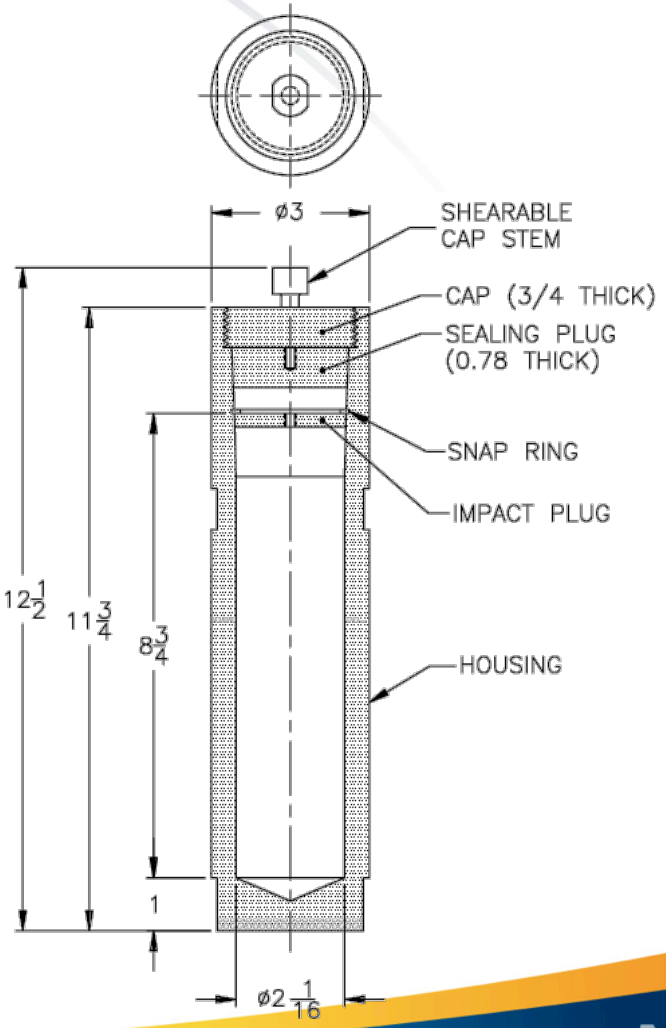
Total International Sources: 2,866 (4,884 Ci)

As of June 30, 2015

OSRP Operations Worldwide

LANL Special Form Capsule

- Solves special form problem
- Useful for consolidation
- Useful for storage and disposition
- Solves some safety and security issues
- Allows Type A shipment

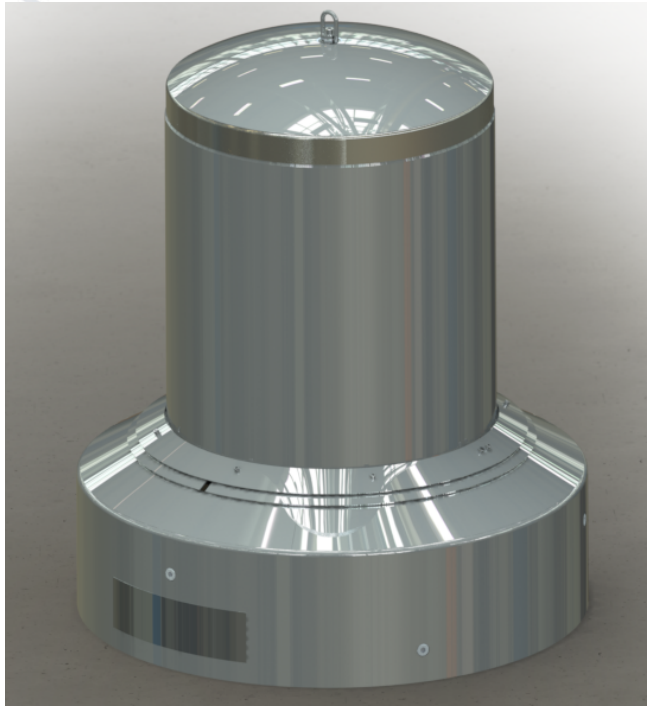


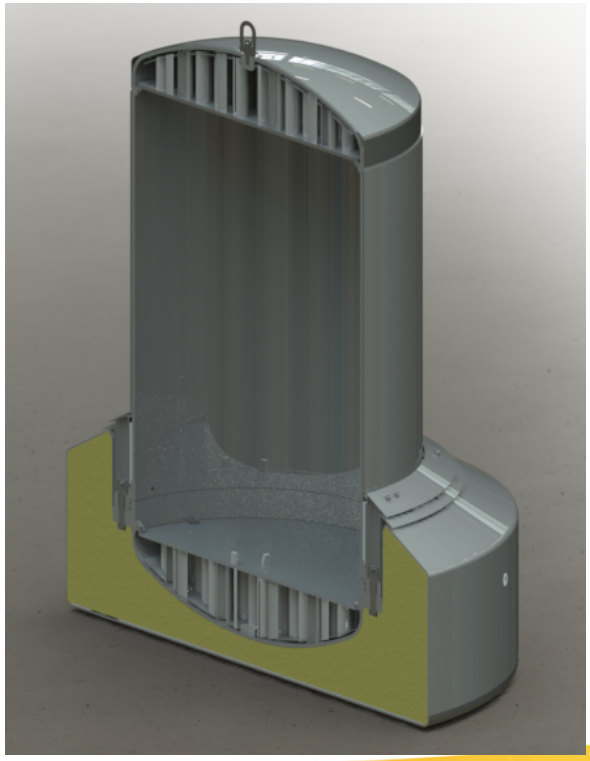
Type B Container Development

- Two types of containers:
  - 435-B Unshielded Type B Container
    - Used to transport radioactive sealed sources in the LTSS and shielded irradiation devices containing sources
  - 380-B Shielded Type B Container
    - Used to transport disused radioactive sources/ devices that cannot be transported in the 435-B

435-B USA/9355 B(U)-96

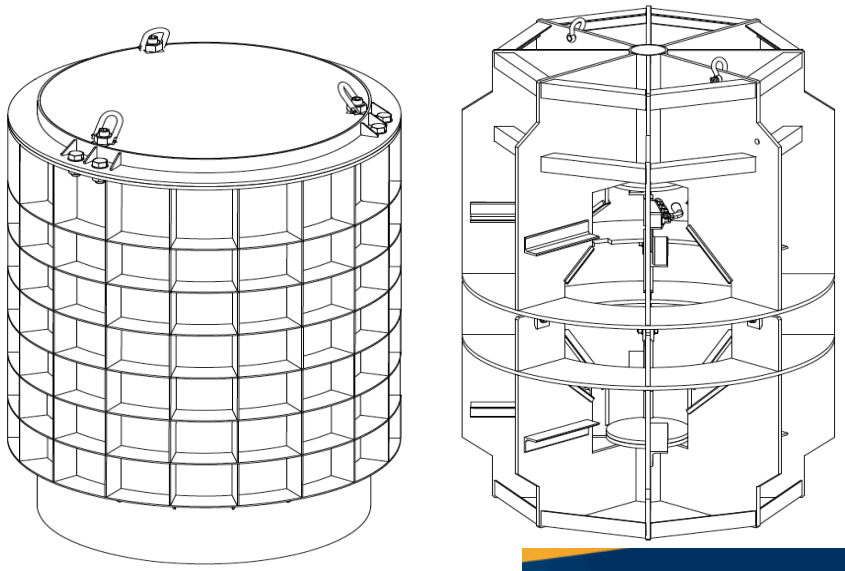
- NRC CoC July 2014
- DoT/IAEA CoCA Feb. 2015





435-B Design

- External construction based on previously certified container
- Design Summary
  - Leak tight – NCT and HAC
  - Transport by truck, rail, ship, air
  - External dimensions 82.6 in H x 70.0 in OD
  - Internal Cavity 43.5 in ID x 60 in H
  - Empty weight 4,870 lb, total weight 10,100 lb



435-B LTSS Payload

Nuclide	Maximum Activity Ci
60Co	12,970
137Cs	14,000
90Sr	1,000
226Ra	20
226RaBe	1.3
241Am	1,000
241AmBe	6.6
192Ir	200
75Se	80

Nuclide	Maximum Mass grams of Pu
238Pu	75 g Pu
239Pu	15 g Pu
239PuBe	15 g Pu

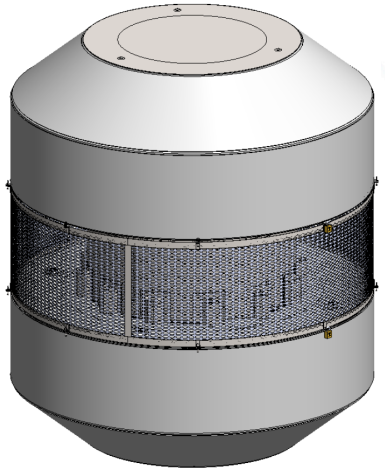
435-B Device Payload

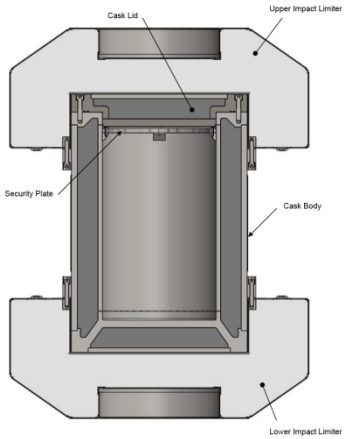
Model Name/Type	Maximum Activity Ci	Nominal Weight lbs.	Sealed Source Device Registry
Group 1 Devices			
Gammator 50B, B, B34, G-50-B	420	1,800	NR-0880-D-802-S
Gammator M34	1,920	1,850	NR-0880-D-806-S
Gammator M38	3,840	2,250	NR-0880-D-806-S
Gammacell 1000 (GC-1000) -Models A through D -Elite A through D, Type I and Type II	3,840 (bounding value)	2,800	NR-0880-D-808-S, NR-1307-D-102-S
Gammacell 3000 (GC-3000) -Elan A through C, Type I and Type II	3,048	3,300	NR-1307-D-102-S
Group 3 Devices			
Gammacell-40 (GC-40 Exactor)	2,250	32,650	NR-1307-D-101-S

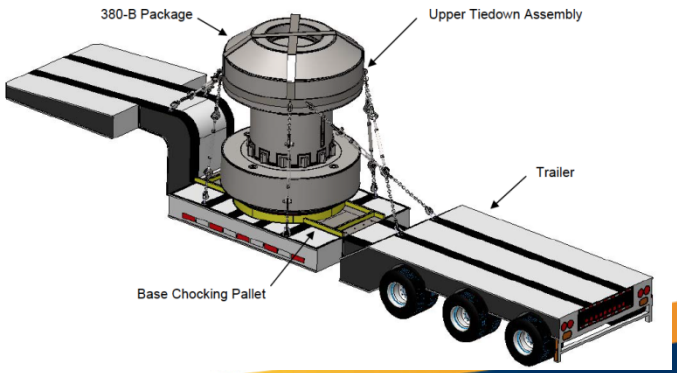
Content Type	Maximum Weight lbs.
Dunnage	≤ 500
Group 1-Shielded Device	≤ 3,500
Group 3-Shielded Device	≤ 3,500

380-B Design

- Design parameters:
  - Co, Cs, Sr, Ir, Ra, Am, Pu and Depleted Uranium
    - Maximum decay heat is 205W
    - Governing activity for Co-60 is 7,500 Ci
    - Design activity of Cs-137 is ~40,000 Ci
- Leak tight – NCT and HAC
- Transport by truck, rail, ship, air
- External dimensions 118” H x 100” OD
- Internal Cavity 48” H x 38” ID
- Empty weight 67,000 lb
- Maximum payload weight including dunnage approximately 12,000 lb







Biggest Recovery Challenge

- Obtaining permission to recover/dispose foreign-origin radioactive material is the biggest challenge to RSP/ OSRP future success.
  - Since 2004, over 20,000 foreign-origin 241Am sources (over 21,000Ci)
  - Recommended source working life is generally 10-15 years
  - If left un-recovered, these pose the same dangers to our national security, public health, and public safety as the any other radioactive source.
  - Since many of these foreign-origin sources are rapidly approaching end of their recommended working life, a looming recovery/disposal crisis appears to be on the horizon.

NNSS Disposal

FY 2015

- Co-60 disposal: 13 shipments totaling (NPI Phase 1 & 2 and UMass Lowell pool irradiator)
  - A portion of the NPI phase 1 recovery (4 of the 10 liners staged at SwRI for disposal)
  - NPI phase 2 recovery will require ~7 shipments

FY 2016

- Co-60 disposal: 2 shipments (disposals from OSRP consolidation facility)
- Cs-137 disposal: 2 shipments (disposals from OSRP consolidation facility)

Out Years

- Continue to dispose prior consolidated material staged at SwRI and 1-2 shipments per year to dispose of recovered sources

Issues- Staging Capacity

- With several shielded liners staged at SwRI along with previously recovered material SwRI began to reach their licensed limit for the amount of radioactive material they could possess on site.
- SwRI requested an increase of their license limit to the state and the request was granted
- However, with several upcoming high activity shipments the licensed limit will soon become an issue again.

Questions?

Contact Information

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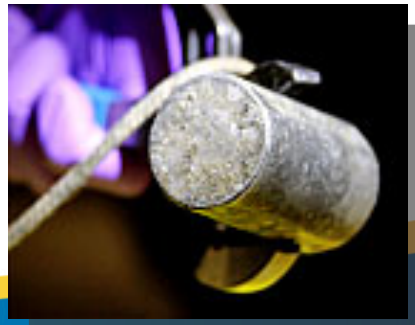
Early Solutions - DOE Source Recovery History

- Late 1970s – 1999: LANL accepts old Pu-239 sources for destruction – about 1,100 until 1999
- 1992 - agreement with NRC that DOE would accept sources identified by NRC as threat to public health and safety or loss of control w/15 responses between 1992 and 2000
- 1999 – DOE EM consolidated three existing programs into the Offsite Source Recovery Project (OSRP)
- 2003 – OSRP transferred to NNSA Defense Nuclear Nonproliferation
- 2004 – Scope expansion beyond four GTCC isotopes

Off-Site Source Recovery Project

- Every year, thousands of sources become disused and unwanted in the US.
- Although secure storage is a temporary measure, the longer sources remain disused or unwanted, the greater the chances increase that they will become unsecured or abandoned. Thus, permanent disposal is essential.
- To carry out its mission, RSP OSRP has the authority to acquire disused sealed sources in the interest of national security or public health and safety.
- OSRP primarily recovers Cs-137, Co-60, Sr-90, Am-241, Pu-238, Pu-239:
  - Every potential recovery is different and must be considered and prioritized. In coordination with the NRC, RSP OSRP has developed recovery prioritization criteria based on its threat reduction mission. Criteria include activity, isotope, location, and vulnerability.
  - Different Types of Recoveries:
    - Transuranics, low-activity (<10 Ci) beta/gamma sources without commercial disposal, and high-activity beta gamma devices.
    - RSP partners with CRCPD on the Source Collection and Threat Reduction (SCATR) project, which works with state regulators and licensees to round up sources with commercial disposal pathways.



OSRP International Recoveries

Country	Number of Sources	Total Decayed Activity (Ci)
Argentina	19	36
Australia	210	52
Austria	1	7
Bolivia	323	17
Brazil	1,002	294
Canada	19	7
Chile	431	22
Denmark	11	44
Ecuador	37	8
France	44	125
Germany	48	14
India	101	289
Israel	7	31
Italy	11	1,202
Japan	1	2
Mexico	1	485
Peru	486	60
Singapore	1	0
South Africa	69	23
Sri Lanka	12	108
Sweden	9	20
Switzerland	5	16
Uruguay	30	2,112
Total	**2,878**	**4,973**

OSRP Actinide Recoveries

OSRP Recovered Sources		
Isotope	Number of Sources	Activity
237Np	162	0.05
238Pu	2,424	12,954.04
239Pu	892	1,208.16
241Am	21,112	16,601.77
244Cm	652	72.93
252Cf	369	1.33
	25,611	30,838.28

OSRP Disposed Sources at WIPP		
Isotope	Number of Sources	Activity
238Pu	2,360	12,173.04
239Pu	565	1,080.15
241Am	18,565	15,738.28
	21,490	28,991.47

OSRP Excess Sources		
Isotope	Number of Sources	Activity
237Np	1	0.00
238Pu	92	3,349.96
238U	83	0.12
239Pu	277	239.00
240Pu	1	0.44
241Am	1,689	1,473.34
244Cm	58	2.81
252Cf	62	0.01
	2,263	5,066

OSRP Beta/Gamma Recoveries

OSRP Recovered Sources		
Isotope	Number of Sources	Activity
137 Cs	6,279	100,936
226 Ra	419	4
60 Co	2,280	242,119
90 Sr	278	641,143
Other	972	238
	10,228	984,440

OSRP Excess Sources		
Isotope	Number of Sources	Activity
137 Cs	244	45,041
226 Ra	3	0
60 Co	2,153	506,461
90 Sr	19	915,193
Other	37	294
	2,456	1,466,990

OSRP Disposed Sources at NNSS		
Isotope	Number of Sources	Activity
137 Cs	1,310	20,896
226 Ra	490	4
60 Co	595	95,336
90 Sr	30	641,130
Other	989	235
	3,414	757,602

Type A(F) Packaging: S300 POC (pipe overpack component)